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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/827,379	04/20/2004	Eric R. Fossum	M4065.0628/P628-B	3781

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EXAMINER	
PIZARRO CRESPO, MARCOS D	
ART UNIT	PAPER NUMBER
2814	

DATE MAILED: 12/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/827,379	FOSSUM, ERIC R.	
	Examiner	Art Unit	
	Marcos D. Pizarro-Crespo	2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 November 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *35-48* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *35-48* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *19 July 2005* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Attorney's Docket Number: M4065.0628/P628-B
Filing Date: 4/20/2004
Claimed Priority Date: 8/29/2002 (Continuation of 10/230,079)
Applicant(s): Fossum
Examiner: Marcos D. Pizarro-Crespo

DETAILED ACTION

This Office action responds to the amendment filed on 11/2/2005.

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after the final rejection mailed on 8/23/2005. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 11/2/2005 has been entered.

Acknowledgment

2. The amendment filed on 11/2/2005, responding to the Office action mailed on 8/23/2005, has been entered. The present Office action is made with all the suggested amendments being fully considered. Accordingly, pending in this Office action are claims 35-48.

Drawings

3. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference character **131** has been used to designate both a conductor layer (see, *e.g.*, par.0039/ll.17) and an insulating layer (see, *e.g.*, fig. 2). Corrected drawing

sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement-drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the examiner does not accept the changes, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 35, 36, 38, and 40 are rejected under 35 U.S.C. 102(e) as anticipated by Zhao (US 6339248).

6. Regarding claim 35, Zhao (see, *e.g.*, fig. 8) shows all aspects of the instant invention including a pixel comprising:

- ✓ A substrate **101**
- ✓ A photoconversion device fabricated in the substrate **101**
- ✓ A charge collection region **103** of the device

- ✓ A first conductivity type reset region **123** formed in the substrate **101**, coupled to the collection region **103**, and configured to apply a reset charge to the collection region in response to a pulsed reset signal applied to the reset region (see, *e.g.*, col.5/ll.30-34)

7. Regarding claim 36, Zhao shows the reset region **123** and the collection region **103** both forming an extended charge collection region (see, *e.g.*, fig. 8), the extended charge collection region also being reset by the pulsed reset signal (see, *e.g.*, col.5/ll.30-34).

8. Regarding claim 38, Zhao shows the pixel further comprising a pulsed voltage source for providing the pulsed reset signal (see, *e.g.*, col.5/ll.30-34).

9. Regarding claim 40, Zhao shows the first conductivity type is n-type (see, *e.g.*, fig. 8).

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11. Initially, and with respect to claims 37 and 42, note that a limitation in a claim with respect to the manner in which a claimed device is intended to be used does not differentiate the claimed device from a prior-art device if the prior-art device teaches all structural limitations in the claims and it is capable of performing the intended use. *In re Schreiber*, 28 F.3d 1473, 1477-78, 44 USPQ2d 1429, 1431-32 (Fed. Cir. 1997); *Ex*

parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). See *Hewlett-Packard Co. v. Bausch & Lomb Inc.* and the related case law cited therein which makes it clear that it is the final product *per se* which must be determined in a device claim, and not the patentability of its functions (909 F.2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990)). As stated in Best,

> Where the claimed and prior art products are identical or substantially identical in structure or composition, a *prima facie* case of either anticipation or obviousness has been established. *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977).

12. **Note that the applicant has burden of proof** once the examiner establishes a sound basis for believing that the products of the applicant and the prior art are the same. See *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990).

13. Claims 37 and 42, 43, and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao in view of Chen (US 6392263).

14. Regarding claim 37, Zhao shows most aspects of the instant invention (see, *e.g.*, paragraphs 6 and 7 above) including:

- ✓ A source follower transistor **151** for outputting a signal representing charge collected in the extended collection region
- ✓ A row select transistor **153** for selectively outputting a signal from the source follower transistor **151**

Zhao also shows the source follower transistor **151** in electrical communication with the extended charge collection region, but fails to show a capacitor in electrical

communication with the reset region **123** and the charge collection region for storing charge collected in the collection region. Chen, however, teaches that doing so would reduce the charge injection effect of Zhao's reset switch (see, *e.g.*, col.6/ll.59-61).

It would have been obvious at the time of the invention to one of ordinary skill in the art to include a capacitor in electrical communication with the reset region and the extended charge collection region, as suggested by Chen, to reduce the charge injection effect of Zhao's reset switch.

15. In reference to the language in claim 37 referring to the function of the capacitor, it is noted that Zhao/Chen show all aspects of the semiconductor device according to the claimed invention (see paragraph 14 above) and that using the capacitor to store charge collected in the collection region is a function that does not affect the structure of the final device. Furthermore, Zhao/Chen's device performs the claimed functions. That is, the carriers generated by the incoming light detected by the photodiode will be stored at the capacitor since one of its plates is directly connected to the photodiode node.

16. Regarding claim 42, Zhao (see, *e.g.*, fig. 8) shows most aspects of the instant invention including a pixel for use in an imaging device, the pixel consisting essentially of:

- ✓ A charge collection region **103** provided in a substrate
- ✓ A reset region **123** in the substrate adjacent to the charge collection region **103** for periodically resetting a charge level of the collection region **103** in response to a reset signal applied to the reset region (see, *e.g.*, col.5/ll.30-34)

- ✓ A source follower transistor **151** for outputting a signal representing charge collected in the collection region **103**
- ✓ A row select transistor **153** for selectively outputting a signal from the source follower transistor **151**

Zhao also shows the source follower transistor **151** in electrical communication with the reset region **123**, but fails to show a capacitor in electrical communication with the reset region **123** and the source follower transistor **151** for storing charge collected in the collection region. Chen, however, teaches that doing so would reduce the charge injection effect of Zhao's reset switch (see, *e.g.*, col.6/ll.59-61).

It would have been obvious at the time of the invention to one of ordinary skill in the art to include a capacitor in electrical communication with the reset region and the source follower transistor, as suggested by Chen, to reduce the charge injection effect of Zhao's reset switch.

17. In reference to the language in claim 42 referring to the function of the capacitor, it is noted that Zhao/Chen show all aspects of the semiconductor device according to the claimed invention (see paragraph 16 above) and that using the capacitor to store charge collected in the collection region is a function that does not affect the structure of the final device. Furthermore, Zhao/Chen's device performs the claimed functions. That is, the carriers generated by incoming light detected by the photodiode will be accumulated at the capacitor since one of its plates is directly connected to the photodiode node.

18. Regarding claim 43, Zhao shows the reset region **123** and the collection region **103** both forming an extended charge collection region (see, *e.g.*, fig. 8). Zhao also shows (see, *e.g.*, col.5/ll.30-34) a voltage source periodically supplying the reset signal.

19. Regarding claim 45, Zhao shows the reset region **123** is doped with an n-type dopant at a first dopant concentration (see, *e.g.*, fig. 8).

20. Claim 39 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao in view of Kochi (US 6670990).

21. Regarding claim 39, Zhao shows most aspects of the instant invention (see, *e.g.*, paragraphs 6-9 above), except for the voltage source coupled to one terminal of a capacitor, the other terminal of which is coupled to the extended charge collection region. Kochi, on the other hand, teaches that doing so would enable Zhao's source follower to operate linearly, *i.e.*, to output a voltage in proportion to the input voltage (see, *e.g.*, col.16/ll.12-14 and col.2/ll.48-50). This would avoid signal deterioration associated with input/output linearity problems in low luminosity regions (see, *e.g.*, col.3/ll.7-8).

It would have been obvious at the time of the invention to one of ordinary skill in the art to include a capacitor having one terminal coupled to Zhao's voltage source and the other terminal coupled to the extended charge collection region, as suggested by Kochi, to avoid input/output linearity deterioration of the source follower in low luminosity regions.

22. Claims 41 and 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao/Chen in view Dasgupta (US 6146939).

23. Regarding claims 41 and 44, Zhao/Chen show most aspects of the instant invention (see, *e.g.*, paragraphs 14, 16 and 17 above) including a capacitor in electrical communication with the reset region and the source follower transistor. As taught by Dasgupta, every capacitor has a capacitance per unit area associated with it. This capacitance may range from 4.3-5.3 $fF/\mu m^2$ depending on the choice and thickness of the capacitor dielectric (see, *e.g.*, Dasgupta, col.1/ll.37 and col.3/ll.13-19). Zhao/Chen, however, fail to specify that the capacitance per unit area of the capacitor is between about 5-10 $fF/\mu m^2$. However, the specific capacitance values claimed will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such values are critical. "Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the workable ranges by routine experimentation". *In re Aller*, 220 F.2d 454,456,105 USPQ 233, 235 (CCPA 1955).

Since the applicant has not established the criticality (see next paragraph) of the capacitance values claimed, and since these values are in common use in similar devices in the art, as taught by Dasgupta, it would have been obvious to one of ordinary skill in the art to use these values in the device of Zhao/Chen.

CRITICALITY

24. The specification contains no disclosure of either the critical nature of the claimed capacitance or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the applicant must show that the chosen dimensions are critical. *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

25. Claims 46-48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao/Chen in view of Wada (US 6677676).

26. Regarding claims 46-48, Chen shows most aspects of the instant invention (see, e.g., paragraphs 16, 17, and 19 above). He also shows that the capacitor **450** is connected to the reset region **307** through an n-type contact region having a second dopant concentration (see, *e.g.*, fig. 4) wherein the second dopant concentration **307** is higher than a first dopant concentration **405**. Chen, however, fails to show the contact region having a higher concentration than the reset region **123**. Wada, on the other hand, teaches that doing so would establish a good electrical connection between the capacitor and the reset region (see, *e.g.*, col.12/ll.28-31).

It would have been obvious at the time of the invention to have Zhao/Chen's contact region having a higher concentration than the reset region, as suggested by Wada, to establish a good electrical connection between the capacitor and the reset region.

Response to Arguments

27. The applicant argues:

> N+ regions 123 and 125 of Zhao are "source and drain of the reset transistor" (col.4/ll.64-65), and not "a reset region...coupled to the charge collection region" and "being configured to apply a reset charge to the collection in response to a pulsed reset signal", as in the claimed invention. For at least these reasons, Zhao fails to anticipate the subject matter of claims 35, 36, 38, and 40.

The examiner responds:

The fact that diffusion region **123** is a source/drain region of Zhao's reset transistor does not oppose the fact that it is also a reset region coupled to the charge collection region **103** and that it is being configured to apply a reset charge to the collection region in response to a pulsed reset signal. See, *e.g.*, col.4/ll.16-26 and col.5/ll.29-34 of Zhao. In support of the examiner's response, see also

Hamada/col.4/ll.20-30,65-67, for a teaching showing a reset transistor similar to Zhao's wherein the source is used to store information charges and wherein a reset charge is applied to the source in response to an ON/OFF reset signal.

28. The applicant argues:

None of the references shows "a capacitor in electrical communication with the reset region and the source follower transistor", as claim 42 recites.

The examiner responds:

In figure 4, Chen clearly shows a capacitor **450** in electrical communication with a reset region **307** and a source follower transistor **332**. See also figure 1C.

29. The applicant argues:

Kochi is silent about any of the limitations of claim 35. Kochi does not even mention, "a photoconversion device fabricated in said substrate".

The examiner responds:

See line 1 of the abstract and figures 7-12 and 17.

Conclusion

30. Papers related to this application may be submitted directly to Art Unit 2814 by facsimile transmission. Papers should be faxed to Art Unit 2814 via the Art Unit 2814 Fax Center. The faxing of such papers must conform to the notice published in the Official Gazette, 1096 OG 30 (15 November 1989). The Art Unit 2814 Fax Center number is **(571) 273-8300**. The Art Unit 2814 Fax Center is to be used only for papers related to Art Unit 2814 applications.

31. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Marcos D. Pizarro-Crespo** at **(571) 272-1716** and between the hours of 9:30 AM to 8:00 PM (Eastern Standard Time) Monday through

Thursday or by e-mail via Marcos.Pizarro@uspto.gov. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy, can be reached on (571) 272-1705.

32. Any inquiry of a general nature or relating to the status of this application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

33. The following list is the Examiner's field of search for the present Office Action:

Field of Search	Date
U.S. Class / Subclass(es): 257/59,72,222,223,225,228-234,290-294,431-466	12/1/05
Other Documentation: PLUS Analysis	8/15/05
Electronic Database(s): EAST (USPAT, EPO, JPO)	12/1/05

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MDP/mdp
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